UNITED STATES DISTRICT COURT
DISTRICT OF MINNESOTA
Crim. No. 19-161 (DSD/DTS)

UNITED STATES OF AMERICA,

v.

DECLARATION OF ERIC J. GRUNWALD PURSUANT TO 28 U.S.C. § 1746

LORENZO EUGENE HEARD JR.

Eric John Grunwald, declares as follows:

1. I am employed by the State of Minnesota, Department of Public Safety, Bureau of Criminal Apprehension (BCA), Forensic Science Services (FSS) Laboratory. I have been so employed since 1999. During that time I have held several roles, including Forensic Scientist 1, Forensic Scientist 2, Forensic Scientist 3, and Forensic Science Supervisor.

2. The BCA is a state law enforcement agency that aids local, state, and federal law enforcement agencies by providing investigative assistance, training opportunities, and forensic science services.

3. I have a Bachelor of Science degree in Chemistry from Northeast Missouri State University and a Master of Science degree in Analytical Chemistry from The Ohio State University. My educational and professional experience is further detailed in the attached curriculum vitae.

4. I am employed as a Forensic Science Supervisor of the Chemistry section. The Chemistry section analyzes evidence suspected to contain a controlled substance.

5. The Chemistry section is a division of the BCA FSS, the only full service, accredited forensic science laboratory in Minnesota. The BCA Chemistry section receives suspected controlled substance evidence from law enforcement agencies across Minnesota. For example, in calendar year 2020, the Chemistry section issued more than 9,600 reports for evidence suspected to contain a controlled substance, often addressing more than one item. During that same year, approximately 100 reports were issued that identified methylenedioxymethamphetamine (MDMA).

6. The BCA FSS is an ISO/IEC 17025 American National Standards Institute (ANSI) National Accreditation Board accredited forensic laboratory. This accreditation demonstrates that management, personnel, operational and technical procedures,

equipment and physical facilities meet international standards. For the Chemistry section in particular, this accreditation requires that analytical procedures be validated (if developed in-house) and/or be evaluated for comparison to their referenced performance characteristics (if adapted from externally validated methods). Reference materials (i.e. known substances, controlled or otherwise) that are compared to unknowns, in order to make an identification, must be purchased from accredited reference material providers.

7. 3,4-methylenedioxymethamphetamine (MDMA) is a hallucinogen and a Schedule I controlled substance in Minnesota. Under Minnesota law, "[h]allucinogen means any hallucinogen listed in section 152.02, subdivision 2, clause (3), or Minnesota Rules, part 6800.4210, item C, except marijuana and Tetrahydrocannibinols." Minn. Stat. § 152.01, subd. 5a (2009).

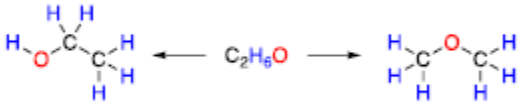
8. Minn. Stat. 152.02 Subd. 2(3) states: "Any material, compound, mixture or preparation which contains any quantity of the following hallucinogenic substances, their salts, isomers and salts of isomers, unless specifically excepted, whenever the existence of such salts, isomers, and salts of isomers is possible within the specific chemical designation: 3,4-methylenedioxymethamphetamine." The 2009 Minnesota state statute does not define the word "isomer." See Minn. Stat. 152.01 (Definitions).

9. 2009 Minnesota Administrative Rules Chapter 6800.4210 Schedule I Controlled Substances provides another definition of hallucinogen: It states: "C. Hallucinogenic substances. Unless specifically excepted or unless listed in another schedule, any material, compound, mixture, or preparation, which contains any quantity of the following hallucinogenic substances, or which contains any of its salts, isomers (whether optical, positional, or geometric), and salts of isomers, whenever the existence of such salts, isomers, and salts of isomers is possible within the specific chemical designation: (7) 3,4-Methylenedioxymeth-amphetamine."

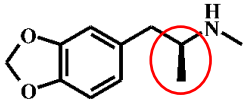
10. 3,4-methylenedioxymethamphetamine (MDMA) is also a controlled substance in the United States of America. It is specifically listed in 2009 21 C.F.R. § 1308.11, "Schedules of Controlled Substances." More specifically, Schedule I(d): "Hallucinogenic substances. Unless specifically excepted or unless listed in another schedule, any material, compound, mixture, or preparation, which contains any quantity of the following hallucinogenic substances, or which contains any of its salts, isomers, and salts of isomers whenever the existence of such salts, isomers, and salts of isomers is possible within the specific chemical designation (for purposes of this paragraph only, the term "isomer" includes the optical, positional and geometric isomers): (11) 3,4-methylenedioxymethamphetamine (MDMA)"

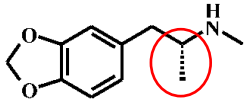
11. Both Minnesota Rule 6810.4210 and 21 C.F.R. § 1308.11(d) similarly state isomers include optical, positional (or position), or geometric isomers. Position and positional isomers are the same thing.

12. While definitions may vary, an "isomer" may generally be described as "different compounds that have the same molecular formula"[1], "two or more compounds with the same molecular formula but different arrangement of atoms"[2], or "compounds possessing the same composition and the same molecular weight, but differing in their chemical structure."[3] Below is a basic example of different compounds with the same molecular formula.



13. Optical isomers have atoms connected in the same order, but those atoms are arranged differently in space. 3,4-methylenedioxymethamphetamine (MDMA) has two optical isomers, denoted S and R. The figures below depict these isomers and indicate the directionality of the methyl group (circled) as either toward (S) or away from (R) the reader.[4] Both are controlled in Minnesota and federally, based on the statutory language cited above.


S-(+)-MDMA


R-(-)-MDMA

14. Positional isomers have an atom or group of atoms in a different position, relative to a carbon chain or ring.[5] 3,4-methylenedioxymethamphetamine has positional isomers, one of which, *2,3*-methylenedioxymethamphetamine, is depicted below.[6] Note the different position of the methylenedioxy group (circled) relative to the

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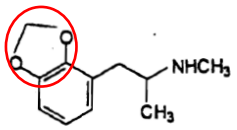
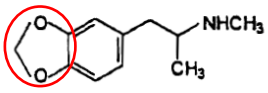
[1] Organic Chemistry, 4th Edition; T.W. Graham Solomons; John Wiley & Sons, Inc.; © 1988
[2] Chemistry & Chemical Reactivity; John C. Kotz and Keith F. Purcell, CBS College Publishing; © 1987
[3] Sharp, D.W.A.; The Penguin Dictionary of Chemistry; 2nd Ed.; © 1990
[4] Muller, M.; 3,4-Methylenedioxymethamphetamine (MDMA, "Ecstasy"): studies on MDMA metabolism and pharmacokinetics in humans and squirrel monkeys; July 2009
[5] Sharp, D.W.A.; The Penguin Dictionary of Chemistry; 2nd Ed.; © 1990
[6] DeRuiter, J., Holston, P.L., Clark, C.R., Noggle, F.T.; Liquid Chromatographic and Mass Spectral Methods of Identification for the Regioisomeric 2,3- and 3,4-Methylenedioxyphenalkylamines; Journal of Chromatographic Science; Vol. 36, March 1998

remainder of the molecule. Both are controlled in Minnesota and federally, based on the statutory language cited above.



2,3-MDMA



3,4-MDMA

15. Geometric isomers have different arrangements of dissimilar atoms or groups attached to two atoms joined by a double bond or forming part of a ring structure.[7] There are no geometric isomers of MDMA.

16. Positional isomers of MDMA have unique names other than 3,4-methylenedioxymethamphetamine (the most similar being the aforementioned *2,3*-methylenedioxymethamphetamine). For example, 3,4-methylenedioxy*phentermine* is a positional isomer of 3,4-methylenedioxymethamphetamine (MDMA), having the same molecular formula as 3,4-methylendioxymethamphetamine, but with atoms arranged differently.

17. Using the aforementioned industry reference materials, the testing process begins largely the same way for most suspected controlled substances. First, a Chemistry section chemist obtains a net weight of the sample. Second, the chemist performs presumptive tests which are not specific to 3,4-methylenedioxymethamphetamine (MDMA) and alone are not used to identify the substance(s). Third, the chemist performs confirmatory tests which provide the chemist a means of identifying the substance(s). These confirmatory tests include (1) Gas Chromatography – Mass Spectrometry (GC-MS) and/or (2) Fourier Transform – Infrared Spectroscopy (FT-IR).

18. Gas Chromatography – Mass Spectrometry (GC-MS): In summary terms GC is a technique that separates the components of a mixture so that they enter the mass spectrometer as pure compounds. GC alone is not an identification technique for 3,4-methylenedioxymethamphetamine (MDMA) or its isomers. MS is a technique that enables the identification of a compound by comparing the compound's mass spectrum to the mass spectrum of a reference material. MS can be used to identify 3,4-methylenedioxymethamphetamine (MDMA). MS can also help a chemist distinguish MDMA from its positional isomers, but it cannot help a chemist distinguish MDMA from its optical isomers.

[7] Sharp, D.W.A.; The Penguin Dictionary of Chemistry; 2nd Ed.; © 1990

19. Fourier Transform – Infrared Spectroscopy (FT-IR) in summary terms is a technique that enables the identification of a compound by comparing the compound's infrared spectrum to the infrared spectrum of a reference material. FT-IR can be used to identify 3,4-methylenedioxymethamphetamine (MDMA), including the salt form (i.e. MDMA hydrochloride). FT-IR can distinguish MDMA from its positional isomers, but it cannot help a chemist distinguish MDMA optical isomers.

20. Both the GC-MS and FT-IR analyses of positional isomers of 3,4-methylenedioxymethamphetamine (MDMA), such *2,3*-methylenedioxymethamphetamine will generate spectra that are different from that of 3,4-methylenedioxymethamphetamine (MDMA).

21. Identification of an unknown sample is made by comparing the data from the unknown substance to data from a reference material. A reference material is defined as "material, sufficiently homogeneous and stable with reference to specified properties, which has been established to be fit for its intended use in measurement or in examination of nominal properties."[8] For MDMA analyses, the BCA FSS Chemistry section only uses reference materials from accredited manufacturers (e.g. Sigma-Aldrich RTC, Inc., Cerilliant Corporation, Cayman Chemical Company).

22. The steps identified above are the entire process used to identify MDMA for cases prosecuted by the state of Minnesota.

23. In 2009 any report issued by the BCA FSS Chemistry section using the language "containing 3,4-methylenedioxymethamphetamine (MDMA)" indicates that an optical isomer of 3,4-methylendioxymethamphetamine (MDMA) was identified.

24. In 2009 any report issued by the BCA FSS Chemistry section identifying a positional or functional isomer of 3,4-methylenedioxymethamphetamine (MDMA) would use the unique name of that compound (e.g. "containing *2,3*-methylenedioxymethamphetamine" or "containing 3,4-methylenedioxy*phentermine*"). Such a report would in turn <u>not</u> indicate a result for 3,4-methylenedioxymethamphetamine (MDMA).

25. On 12/11/2009, the BCA issued Report No. 1 for BCA Laboratory No. S09-16587. Mr. Heard was identified as a principal in that case. Laboratory items number 1 (consisting of sub-items 1A – 1F) and number 2 (consisting of sub-items 2A – 2E) were both reported as "containing 3,4-methylenedioxymethamphetamine

[8] International vocabulary of metrology – Basic and general concepts and associated terms (VIM), 3rd edition; 2008 version with minor corrections; © JCGM 2012

(MDMA)." This reporting indicates that an optical isomer of MDMA was identified.

26. The testing processes described above are the entirety of the procedures used by the BCA FSS Chemistry section when evaluating a substance resulting in a result of 3,4-methylenedioxymethamphetamine (MDMA).

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. I executed this declaration on the date indicated below.

November 29, 2021

Digitally signed by Eric J Grunwald
Date: 2021.11.29 15:58:42 -06'00'

Eric J. Grunwald